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Description

Locker Lock

Cross Reference to Related Applications

[0001] This invention claims priority to United States Provisional Patent Application Serial No. 60/419,250, entitled LOCKER LOCK DIAL filed October 17, 2002.

Background of Invention

[0002] Lockers have been around for many years as a means of preventing the unauthorized access of others to articles contained within the locker. Over the years, locks have been made in many different shapes and sizes, and with their respective right-hand and left-hand door models, for many applications. The locker designs have changed slightly, but the locker locking mechanism has stayed fairly constant.

[0003] Typically, locker locking mechanisms consist of two types: the single-point latching mechanism and the multiple-point latching system. Both types of locker locking mechanisms are positioned furthest from the hinges and near-

est the edge of the locker door that opens, and in the center position of that edge. This increases the strength of the locking mechanism by providing the best possible mechanical advantage. The single-point latching system provides a single point where the locker door is prohibited from opening. This type of latching system typically is designed to utilize either a hang-on lock or a horizontal built-in lock. The multiple-point latching mechanism provides multiple points where the locker door is prohibited from opening. The multiple-point latching system typically is designed to utilize either a hang-on lock or a vertical built-in lock.

[0004] Historically there have been three types of built-in locker locks: the vertical built-in lock; the horizontal built-in spring bolt; and the horizontal built-in dead bolt. Each of these locks have been designed to accommodate both the right-hand and the left-hand door models, doubling the total number of built-in locks used for locker to six.

[0005] The vertical built-in lock is named for the relative movement of its locking bolt and assembly to the locker. Present vertical built-in locks are available for both doors through the use of multiple models. Present vertical built-in locks provide for a certain amount of movement of the

locking bolt. The amount of movement in which the locking bolt can move can lead to manipulation of the lock by flexing the locker, thereby allowing the locker rods to be removed from their respective locking positions, and compromising the locker lock integrity.

[0006] Both the horizontal built-in spring bolt and the horizontal built-in dead bolt are named for their relative locking bolt movements, and their particular modes of locking. Both of the horizontal build-in locks have a designed degree of movement allotted to the locking bolt. This amount of movement can lead to manipulation of locker lock by flexing the locker. This is especially true on larger lockers. As with the vertical built-in locks, flexing of the locker can allow for movement of the locking bolt, thereby allowing for the locker door to be opened.

[0007] Present horizontal built-in dead bolt designs provide for increased security, as compared with the present horizontal built-in spring bolt designs; however the increased security compromises the ease of use when locking and unlocking the locker. The horizontal dead-bolt design prohibits manipulation of the locking bolt by contact with objects that can fit through holes in the locker. To open the locker without a key, the combination must be dialed.

Once the dial reaches the last combination, the lock is ready to open. Further turning of the dial pushes the locking bolt into the retracted or unlocked position, thereby allowing the locker door to open. The locking bolt is then left in the open position until the dial is turned back the opposite direction. The locker door must then be closed and the dial must be turned to extend the bolt to the locked position. This makes the locking dead bolt inconvenient to use, as the door and dial must simultaneously be manipulated in order to shut the locker.

[0008] Present horizontal built-in spring bolt designs provide for increased convenience over the horizontal built-in dead bolt, in that once the combination is dialed and the dial is turned further to push the locking bolt into the unlocked position, the locker door can be opened and closed without additional manipulation of the dial. This is because the bolt is spring-loaded. However, since the locking bolt is spring-loaded, it can be manipulated by pushing on the bolt with and object that passes through the locker holes or crevice between the door and the locker wall.

SUMMARY OF INVENTION

[0009] The present invention relates to a locker lock design that can be made into a vertical built-in latching mechanism or

a horizontal built-in latching mechanism. The improved locker lock provides for a high degree of security as well as a high degree of convenience in use. The present locker lock also provides an improved locker combination change mechanism.

Brief Description of Drawings

[0010] Figures 1-4 illustrate the present invention lock assembly, wherein the key cylinder is in the locked position.

[0011] Figures 5-7 illustrate the present invention lock assembly, wherein the key cylinder is in the unlocked position.

[0012] Figures 8-11 illustrate the present invention lock assembly, wherein the locking slide is disengaged from the guide.

[0013] Figures 12-13 illustrate the present invention lock assembly, wherein the guide and bolt are moved to allow the locker door to be opened.

[0014] Figures 14-20 illustrate the present invention vertical lock assembly and operation with the combination and the relative position between the locked position and the unlocked position.

[0015] Figures 21-28 illustrate the present invention lock assembly and the combination changing mechanism employed therewith.

[0016] Figures 29-34 illustrate the present invention vertical lock assembly and dial in different subassemblies to show the relative position of each of the parts of the lock assembly.

[0017] Figures 35-43 illustrate the present invention horizontal lock assembly and dial in different subassemblies to show the relative position of each of the parts of the lock assembly.

[0018] Figures 44-57 illustrate the present invention horizontal build-in lock assembly in the locked and unlocked position.

[0019] Figure 58 is a schematic exploded view of the components of the horizontal lock assembly.

DETAILED DESCRIPTION

[0020] Operation of the Key-Operated Vertical Built-In Lock Assembly

[0021] Figures 1 shows the present invention in a semi-assembled view of the lock and dial in the locked position. For the vertical built-in lock assembly, when the dial assembly *100*, which includes number dial *23*, tumbler dial *22*, key cylinder *21*, ball bearing *20*, dial cam *19* and tumbler extension *17*, is in the locked position, as shown in Figure 1, the dial assembly *100* can rotate about the axis of the tumbler dial *22* axis without engaging dial cam *19*

into plug extension *7*. In this state, the lock can only be opened with the proper combination. If, however, the proper key is inserted into the key cylinder *21* and turned clockwise (as shown in the figures), the key will drive dial cam *19* into engagement with plug extension *7*, as shown in Figures 5-7. Once the plug extension *7* is engaged, and rotated to the designated stop, the continued rotation of the key will rotate the dial assembly *100* with plug extension *7* thereby disengaging locking slide *8* with guide *4*. This is shown in Figures 8-11. Once the guide *4* is disengaged, the guide *4* can be moved along with the bolt *5* and bolt retainer *15* by the locker handle (not shown) vertically (as shown in the drawings), thereby disengaging the locker door mechanism and allowing the locker door to be opened, as shown in Figures 12-13. Once release, and the key is turned back for removal, guide spring *3* push the guide *4*, bolt *5* and bolt retainer *15* back into the center of the lock, where locking slide *8* is reengaged into guide *4* by the force applied by slide spring *14*, and the lock is then relocked.

[0022] Operation of the Dial Operated Vertical Built-In Lock

[0023] Figure 14 shows the top view of the vertical lock in the locked position with top tumbler *10*, middle tumbler *12*,

and bottom tumbler *13* in the upset position. The bolt *5* can be pushed up very slightly until the bolt retainer *15* advances to the tumblers *10*, *12*, and *13*, and stops. This does not allow the bolt retainer *15* to disengage the locking slide *8* with guide *4*, and allow the bolt to move to its fully opened position. As shown in Figure 15, when the dial is turned, tumblers *10*, *12*, and *13* are manipulated to the proper position, bolt *5* can push the bolt retainer *15* into tumblers *10*, *12*, and *13*. This will also disengage locking slide *8* from guide *4*, and thus allows bolt *5* to move to the fully opened position. The guide *4* and bolt retainer *15* follow as well as tumblers *10*, *12*, and *13*. This is shown in Figures 16-18. When the lock is released, the bolt *5*, bolt retainer *15*, and guide *4* will be pushed back into their original position by guide spring *3*. Simultaneously, the lock slide spring *14* in conjunction with the pressure slide *6* will push the bolt retainer *15* out of tumblers *10*, *12*, and *13*. The momentum of tumblers *10*, *12*, and *13* will carry them past the position where the lock can be opened again, as shown in Figures 19 and 20. Due to the symmetry of the lock, it can be pushed in the opposite direction for use on the opposite hand locker door.

[0024] Regardless of whether the present invention vertical built-

in lock is operated by key or by manipulation of the combination dial, the present invention vertical built-in lock provides for easier use and improved security over the prior art. Specifically, the design of the present invention built-in vertical lock provides for increased movement of the locking bolt, namely from 3/8 inch to 15/32 inch. This increased movement of approximately 3/32 inch provides for greater engagement and travel of the locking rods, which further minimizes the ability to corrupt the locking mechanism which would allow unauthorized entry into the locker. In addition, the vertical built-in lock of the present invention is symmetrical, thereby allowing one lock to be used on either right-handed or left-handed lockers.

[0025] Operation of the Key-Operated Horizontal Built-in Lock

[0026] Opening the horizontal lock is similar to opening the vertical lock, as far as the dial assembly is concerned. The dial cam *119* engages the plug extension cam *104* on the horizontal lock in a similar manner as it did on the plug extension *7* with the vertical lock. Figures 44-57 illustrate the horizontal built-in locking assembly. The locked positioned and alignment of the lock and dial are shown in Figure 56. Once the dial cam *119* is engaged, and rotated

to the designated stop, the continued rotation of the key will rotate the dial assembly *200*, including number dial *123*, tumbler dial *122*, lock cylinder *121*, ball bearing *120*, dial cam *119*, and tumbler extension *117*, with plug extension cam *104* thereby moving cam plate *105*. Since paw plate *107* and bolt *108* are stopped against cam plate *105*, the entire assembly will be moved to the open position, and the locker door can now be opened, as shown in Figure 57. Once released, and the key is turned back for removal, plug extension cam spring *103* rotates plug extension cam *104* back to its original locked position, while springs *114,* or bolt and paw plate springs, push cam plate *105*, paw plate *107* and bolt *108* back to the locked position of the lock.

[0027] Operation of the Dial-Operated Horizontal Built-In Lock

[0028] Figures 44 and 45 show the top view of the horizontal lock in the locked position with top tumbler *111*, middle tumbler *112*, and bottom tumbler *113* in the upset position. The bolt *108* can not be pushed in due to the plug extension cam *104*, cam plate *105* and paw *115* all being in the locked position. As shown in Figure 46, when the dial is turned and tumblers *111*, *112*, and *113* are manipulated to the proper position, paw *115* can push paw spring *115a*

into tumblers *111*, *112*, and *113*. Further turning of the dial will push paw *115*, and paw plate *107* against bolt *108* and retract bolt *108* to the open position, as shown in Figure 47. When the locker is opened, the dial can be released, and paw spring *115a*, paw plate *107* and bolt *108* will return to the previous position by bolt and paw plate springs *114*, as shown in Figure 48. In this position, the lock can be opened and closed as many times as needed, but only by turning the dial back and forth. If, however, the locker door is closed and the dial is not turned, paw *115* and paw plate *107* will stay in the position shown in Figure 48 by the lower spring *14* while the bolt *108* along with upsetter *109a* will move into the open position by the edge of the locker, as shown in Figures 49 and 50. This will allow upsetter *109a* to disengage paw plate *107* and engage into tumbler *111*. When the locker is finally closed, the bolt *108* will move to the locked position by the upper spring *114* while upsetter *109a* will stay engaged into tumbler *111*, as shown in Figures 51 and 52, until there is adequate room between cam plate *105* and bolt *108* for upsetter spring *109* to pull upsetter *109a* and rotate *111* ultimately pushing paw *115* back into the locked position, as shown in Figures 53 and 54. Due to all parts being posi-

tively engaged and disengaged by springs, the lock can be used on the opposite hand locker door.

[0029] Regardless of whether the present horizontal built-in lock is operated by key or by manipulation of the combination dial, the present horizontal built-in lock provides for easier use and improved security over the prior art. Specifically, the design of the present built-in horizontal lock provides for increased travel or movement of the locking bolt, namely from 7/32 inch to 13/32 inch. This increased movement of approximately 3/16 inch provides for greater engagement and travel of the locking rods, which further minimizes the ability to corrupt the locking mechanism which would allow unauthorized entry into the locker. In addition, the horizontal built-in lock of the present invention is symmetrical, thereby allowing one lock to be used on either right-handed or left-handed lockers. Furthermore, the present invention horizontal built-in lock includes the security of the present dead bolt mechanisms and the ease of use of the present spring bolt mechanisms. The present invention is designed to be a dead bolt in the locked position. When the proper combination is dialed, further rotation of the dial will push the locking bolt into the unlocked position, and allow the

locker door to open. When the locker is open, the dial can be released, and the bolt will extend. The bolt is however, not in the dead bolt position, but rather in the spring bolt position. The locker can then just be closed. The bolt then acts like a spring bolt in that the locking bolt will retract into the lock and once the locker door is in the closed position, the locking bolt will extend back to the locked position. The lock will then be in the dead bolt mode. This means that it is designed for more security in that the bolt can not be manipulated by objects stuck into the locker.

[0030] Built-In Dial Combination Changes With Key

[0031] Figures 21-23 show a semi-assembled view of the lock and dial in the locked position. Ball bearing *20* protrudes from the tumbler dial *22* and engages the number dial *23* through ball bearing holder *23a*. The engagement of ball bearing *20* in holder *23a* forces number dial *23* to spin in conjunction with tumbler dial *22*. As shown in Figures 24-26, when the proper key is inserted into the cylinder plug *21* and turned counter-clockwise (as shown in the Figures), dial cam *19* will be driven to allow ball bearing *20* to drop into pocket *23b* in dial cam *19*, thereby disengaging number dial *23* from tumbler dial *22*. The number dial *23* can then be rotated to another position relative to the

entire dial assembly *100*. The outside of the number dial *23c* includes an indicator *205* to provide the combination changer with the proper combination code. One skilled in the art will appreciate that the indictor can be any type of mark, including a dot or series of lines, or grooves, or flat spaces, such as to indicate position. In addition the indictor may also be located on the tumbler dial or another piece the is visible and can provide indication of relative position of the number dial. The lock cylinder *21* can then be rotated back to center, and the lock will have a different combination. Figures 21 and 28 show the relative change in the number dial such as to provide a new combination.

[0032] The lock assembly of the present invention offsets the entire lock cylinder *21* to allow a larger cylinder to be placed in the dial with the same relative size as the old dial. This offset of the achieved through the design of the dial cam *19* on the end of the lock cylinder *21*. The larger cylinder enables the use of an industry standard cylinder, the use of more pins, and the use of more intricate security pins. This will provide greater security, more key cut permutations, and true master key system availability options. In addition, the use of the larger cylinder allows for a larger

number of different combination changes. Whereas traditional locker locks have about 5 different changes, the locker lock of the present invention can provide for 12 or more different combinations.

[0033] The lock assembly of the present invention also provides for ease of use in the changing of the combination used on the dial. Current assemblies require the locker to be opened, the key to be inserted and rotated and held in position while a button on the back of the lock, inside the locker door, is held. When the button is pressed, the internal driver pin is dislocated and the dial most be continuously turned until the driver pin engages into another position. The key must be turned backed to the locked position and then be removed form the lock cylinder. One the combination has been changed, it must be manually dialed and checked to positively identify the proper position of the internal changing mechanism, ensuring the correct combination. Use of the present invention and the indicator *205* on the outside of the dial signifying the code number, indicating the proper number for the combination code, provides for a much more efficient method of changing the locker combination. The combination code will be known only by the combination changer, so it can

not be determined by anyone else. The combination changer can use a system for storing such codes so that retrieval is simplified. As indicated above, to change the lock combination, the key is inserted and turned counter-clockwise, the number dial *22* is turned relative to the tumbler dial *23*. The key is then turned back to the locked position and the key is removed. The number signified by the indicator *205* is the code for the lock combination. The locker does not need to be opened and the combination does not need to be checked.

[0034] The present invention also includes a retaining plate *24* which provides a new and improved design. It also has two places for screws to drop in, so a further covering of the screws with a sheet metal plate is unnecessary. A plastic piece *18* that has holding points inside of its two small holes, allows for easy assembly.

[0035] The foregoing descriptions of preferred embodiments of the invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise form disclosed. Obvious modifications or variations are possible in light of the above teachings. The embodiments provide an illustration of the principles of the invention and their

practical application, and enable one of ordinary skill in the art to utilize the invention in various embodiments with various modifications suited to the particular use contemplated, and within the scope of the invention as set forth in the following claims.